

# ECE 432 – Dynamics of Electromechanical Energy Conversion

**Catalog Description:** Generalized machine theory. Techniques for dynamic analysis of electromechanical machines: dq representations of machines.

**Credits:** 4                    **Terms Offered:** Spring, in alternate years

**Prerequisites:** ENGR 331, ENGR 212 (or 212H)

**Courses that require this as a prerequisite:** None

**Structure:** Three 50-minute lectures per week

**Instructors:** T. Brekken (primary), A. von Jouanne (secondary)

## Course Content:

- Principles of energy conversion
- Parameter calculation and measurement
- Reference frame theory
- Analysis of DC machines
- Analysis of induction machines
- Analysis of synchronous machines
- Analysis of brushless DC drives
- Transfer functions and basic control theory

## Measurable Student Learning Outcomes:

At the completion of the course, students will be able to...

1. **Explain** the basic reasons why dc machines are inherently more controllable than ac machines (ABET Outcomes A, C, j, m, n)
  2. **Understand** the principles and methods of transformation from three-phase to two-axis quantities (ABET Outcomes A, c, E, K, m, n)
  3. **Transform** the quantities of a three-phase induction motor to its two-axis equivalent and **develop** the electrical and mechanical performance equations for dynamic operation (ABET Outcomes A, c, E, K, m, n)
  4. **Transform** the quantities of a three-phase synchronous motor or generator into its two-axis equivalent and **develop** the electrical and mechanical performance equations for dynamic operation (ABET Outcomes A, c, E, K, m, n)
  5. **Demonstrate** the methods for the two-axis modeling of other forms of electrical machines (ABET Outcomes A, c, E, K, m, n)
  6. **Perform** laboratory experiments using the above concepts (ABET Outcomes A, B, o, Q)
- Graduate students must also use high level simulation tools, including GUI interfaces.

## Learning Resources:

- Mohan, *Advanced Electric Drives*, MNPERE, 2001

## Students with Disabilities:

Accommodations are collaborative efforts between students, faculty and Services for Students with Disabilities (SSD). Students with accommodations approved through SSD are responsible for contacting the faculty member in charge of the course prior to or during the first week of the term to discuss accommodations. Students who believe they are eligible for accommodations but who have not yet obtained approval through SSD should contact SSD immediately at 737-4098.

**Link to Statement of Expectations for Student Conduct:**

<http://oregonstate.edu/admin/stucon/achon.htm>

Revised: 10/23/07